

**Antonina Fedorovna Prikhot'ko (On her eightieth birthday)**

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In April 1986 the scientific community celebrated the eightieth birthday of a scientist very prominent in the field of solid state physics, a Hero of Socialist Labor, Academician of the Academy of Sciences of the Ukrainian SSR Antonina Fedorovna Prikhot'ko. In the course of sixty years her life has been closely connected with the development of Soviet physics.

Antonina Fedorovna was born in Pyatigorsk where she graduated from a secondary school and entered the Leningrad Polytechnical Institute enrolling in the engineering physics faculty (she graduated from it in 1930). The able third year student was introduced to scientific work in the Physicotechnical Institute by I. V. Obreimov. Her development as a scientist began within the walls of the famous school of physicists of A. F. Ioffe and was contemporaneous with the beginning of the rapid growth of Soviet physics. Here in 1927–1929 working together with I. V. Obreimov on the development of his idea concerning the discrete nature of the spectra of crystals at low temperatures Antonina Fedorovna carried out the first spectral experiments with different molecular crystals. These investigations gave rise to a new direction in solid state physics—the low temperature spectroscopy of molecular crystals, to the development of which Antonina Fedorovna devoted all her subsequent scientific activity.

In 1930 Antonina Fedorovna together with a group of young talented Leningrad physicists headed by I. V. Obreimov transferred to work in Khar'kov where a new scientific center—the Ukrainian Physicotechnical Institute was being created. In UFTI—the name given to the junior brother of the Leningrad Physicotechnical Institute—the first cryogenic laboratory in the USSR was organized; here the conceptual and methodological bases of low temperature physics and of low temperature spectroscopy in particular are being actively developed. The investigations begun in Leningrad here received a new, qualitatively different experimental base—temperatures down to helium temperatures, polarized light, the use of single crystal samples. On this basis absorption spectra of typical molecular crystals of naphthalene, anthracene, and phenanthrene were investigated. A detailed analysis of the fine structure of spectra was carried out, a classification of electronic and electronic-vibrational bands was made, the vibrational frequencies of molecules in excited states were determined. Work was begun on a special class of crystals which Antonina Fedorovna later aptly



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named "cryocrystals." A special place among them is occupied by solid oxygen—towards the blue crystals of its different modifications Antonina Fedorovna has a special predilection.

The degree of candidate of physico-mathematical sciences was awarded A. F. Prikhot'ko without having to defend a dissertation.

The grave tribulation experienced by our country—the Second World War—made it necessary to evacuate many scientific research institutes of the country. A. F. Prikhot'ko went to Ufa where the Institute of Physical Chemistry of the Academy of Sciences of the Ukrainian SSR obtained temporary quarters. The programme of the work of the laboratory

was aimed at the pressing needs of aiding the front. In 1943 having concluded the analysis of the prewar experimental data Antonina Fedorovna successfully defended her doctoral dissertation, thus becoming one of the first women in the USSR to receive a doctor's degree in physico-mathematical sciences. In her dissertation she clearly demonstrated the existence of and the absorption by molecular crystals of series of "purely crystalline" bands associated with the collective absorption by a crystal.

After liberation of the Ukraine from Fascist occupation Antonina Fedorovna came to Kiev and since 1944 has been working in the Physics Institute of the Academy of Sciences of the Ukrainian SSR.

Antonina Fedorovna's first activity in her new post was the organization of a cryogenic laboratory. In the course of several years the production and use in physical experiments of liquid nitrogen, hydrogen, and later helium was accomplished in the new building of the Physics Institute of the Academy of Sciences of the Ukrainian SSR. This cryogenic laboratory was the second in the Ukraine and the third in the USSR. Concurrently the development of methods of low temperature spectroscopy and optical investigation of crystals was taking place. A most important and a fundamental step in this direction was the aim to develop metal optical cryostats, while in the rest of the world glass ones were being used. The successful introduction of metal cryostats has greatly broadened the experimental possibilities of the new direction. The culmination of this stage of Antonina Fedorovna's activity was the first All-Union conference on low temperature physics organized on her initiative in Kiev in 1955; since that time such conferences have become traditional.

At the end of the 1940's and in the early 1950's A. F. Prikhot'ko together with collaborators carried out investigations on and the systemization of spectra of crystals of a very broad class of organic compounds. One of the papers of that period had just such a title "Experience of a wide-ranging investigation of the spectra of crystals of organic compounds at low temperatures."

A series of fundamental investigations of excitons in crystals for which Antonina Fedorovna together with a group of other scientists was awarded a Lenin prize in 1966 was carried out in 1950-1965 in the Physics Institute of the Academy of Sciences of the Ukrainian SSR. On the initiative of A. F. Prikhot'ko the first All-Union seminar "Excitons in

Crystals" was organized in 1965, and has been successfully functioning for twenty years, and Antonina Fedorovna is the chairman of the continuing organizational committee of the seminar. Now the concept of excitons is widely used not only in solid state physics, but also in chemistry and in biology.

In the development of our concepts of excitons a significant role was played by the work of A. F. Prikhot'ko together with her pupils on the isotopic method of investigating the origin and structure of exciton bands. Also an important step was the discovery of the characteristic exciton light emission by molecular crystals. The developed precision quantitative methods of measuring the absorption and dispersion of light in molecular crystals laid the foundation for the crystal optics of absorbing media.

In the course of recent years Antonina Fedorovna together with her pupils in collaboration with theoreticians from the Theoretical Physics Institute of the Academy of Sciences of the Ukrainian SSR carried out important investigations of the absorption spectra of various modifications of oxygen crystals, and the effect of magnetic fields, of temperature, of different impurities on the energy structure of cryocrystals. An essential role in the analysis of the energy spectrum of oxygen crystals was played by the discovery of the biexciton and exciton-magnon states. These investigations have been brought together by A. F. Prikhot'ko in the collective monograph "Cryocrystals." The work of A. F. Prikhot'ko on the spectroscopy of crystals has been recognized by the award of a State Prize of the Ukrainian SSR.

A. F. Prikhot'ko has created a scientific school on the spectroscopy of nonmetallic crystals. Her pupils are now academicians and corresponding members. She is the author and coauthor of 150 scientific articles, and three monographs.

In 1948 A. F. Prikhot'ko was elected corresponding member of the Academy of Sciences of the Ukrainian SSR and in 1964 a full member. In 1976 she was awarded the title of Hero of Socialist labor.

At present A. F. Prikhot'ko continues actively to pursue scientific and organizational work, heads the department of crystal physics in the Physics Institute of the Academy of Sciences of the Ukrainian SSR. We wish her good health and new creative successes in her further creative work for the benefit of Soviet science.

Translated by G. M. Volkoff